# SEASONAL VARIATION IN CHEMICAL COMPOSITION OF TWIGS AND LEAVES OF PHULAI (*ACACIA MODESTA*)

•Sana Ullah Khan, ••Javaid Ahsan, ••Mansoor Ali & ••M. Mahboob-Ur-Rahman

## ABSTRACT

*Twigs and leaves of Acacia modesta are excellent fodder for livestock. The samples of Acacia modesta were collected bimonthly from Rakh Dagar Kotli for two years i.e. during 2007 and 2008. The proximate analysis indicated 30.72 – 47.48 percent dry matter (DM), 17.37 – 19.38 percent crude protein (CP), 35.5 – 39.95 percent crude fibre (CF), 3.49 – 3.99 percent ether extract (EE), 7.35 – 10.32 percent ash and 28.31 – 35.91 percent nitrogen – free extract (NFE). It should be advised on the basis of data that twigs and leaves of Acacia modesta must be utilized in spring season from nutritional point of view.*

## INTRODUCTION

The current status of animal protein deficiency in developing world is caused by lack of forage. Trees and shrubs play dual role serving both as shade and forage supply for livestock. During dry season, shrubs and trees provide green fodder i.e. twigs, leaves, flowers, fruit etc., often rich in protein, vitamins and minerals. However, during non-availability season, animals depend upon straw only from native grasses and this poor feed causes avitaminosis, mineral deficiencies and severe debilitation.

Pakistan is an agricultural country having a head of 154.7 million of livestock which contribute 11.3% towards the GDP (GOP, 2009-10). Nutritional requirements of these animals are mainly met through fodder crops, grasses and shrubs. Akram (1990) reported that livestock were getting only 75% of required amount of total digestible nutrients and there was 60% shortage of digestible crude protein. Due to ever increasing human population the demands of meat, milk and milk products are also increasing, these demands could be overcome by improving the quality and quantity of feed which could enhance livestock production up to 50% from existing genetic pool of animals

(Hasnain, 1983). Fodder trees and shrubs constitute a vital component in livestock productivity in the arid and semi-arid zones. They supply goats and camels with the bulk of their nutritive requirements and complement the diet of cattle and sheep with protein, vitamins and minerals in which bush straw is deficient during the dry season. Nutrition of game animals also greatly depends on them. Twigs and leaves of fodder trees contribute a major source of livestock feed. Leaf fodder of some trees is almost as nutritious as that of leguminous fodder crops (Singh, 1982). Phulai (*Acacia modesta*) is one of the most valuable forage species due to its palatability and nutritive content (Laurie, 1945). It is relished by all classes of livestock (Troup, 1921; Said, 1951) and many species of wildlife (Robert, 1977; Khan, 1979). Twigs and leaves of fodder trees contribute adequate amount of feed to livestock. In rain-fed areas of Pakistan, the green fodder is scarce and so drought resistant fodder tree species are desirable. Leaf fodder of some trees is almost as nutritious as that of leguminous fodder crops (Singh, 1982).

Chemical composition of leaves varies in different months but the change in chemical composition at different localities is not regular as it is influenced by edaphic and climatic changes (Singh and Mudgal, 1967). Chemical composition is a fair indicator of feeding value of a plant species. Information of seasonal variation in chemical composition provides a guideline for utilizing tree fodder at specific stages to ensure optimum use. Little literature is available about seasonal variation in chemical composition of twigs and leaves of *Acacia modesta*. Some *Acacia* species such as *Acacia albida*, *A. tortilis* and *A. erioloba* contain substances such as cynogenic glucosides,

•Director, Punjab Forestry Research Institute, Faisalabad
••Research Officers, Punjab Forestry Research Institute, Faisalabad



Scanned with CamScanner

fluoroacetate or tannins which may considerably reduce their nutritive value or even toxic to animal. However, toxicity depends upon the concentration of the deleterious compound in the fodder and the rate at which the forage is eaten. "An amount of the plant eaten quickly, say in one hour, could be fatal whereas the same amount of plant material eaten slowly over, for example, a five hour period, would be harmless" (Storrs, 1982).

This study was, therefore, planned as an effort to investigate seasonal variation in chemical composition of twigs and leaves of *Acacia modesta*.

## MATERIAL AND METHODS

*Acacia modesta* raised at Rakh Dagar Kotli were selected for this study. The samples of green leaves and twigs (less than 15.24 cm in length) were collected randomly on bi-month basis (in January, March, May, July, September and November) for two years i.e. 2007 and 2008. The samples were weighed immediately and preserved in air tight polythene bags, already marked for identification. The samples were dried in oven at 55 $^{0}$C to a constant weight. The difference between the fresh and dry weight indicated the moisture content of the samples. The dry matter percent was thus calculated by following formula:

$$\text{Dry matter percent} = \frac{\text{Dry weight of the sample}}{\text{Fresh weight of the sample}} \times 100$$

The dried samples were ground to 0.5 – 1.0 mm mesh and preserved for proximate analysis AOAC (1984) for following parameters:

1. Dry matter (DM) %
2. Crude protein (CP) %
3. Crude fibre (CF) %
4. Ether extract (EE) %
5. Ash %
6. Nitrogen – free extract (NFE) %

The proximate analysis for above parameters was done in triplicate and the mean values were calculated.

## RESULTS AND DISCUSSION

The results about variation in chemical composition of twigs and leaves of *Acacia modesta* are shown in table – 1 and are summarized in the following paragraphs.

**Table – 1: Chemical composition of twigs and leaves of *Acacia modesta***

| | DM % | CP % | EE % | CF % | ASH % | NFE % |
|---|---|---|---|---|---|---|
| January | 33.94 | 18.84 | 3.49 | 36.97 | 9.84 | 30.86 |
| March | 39.04 | 19.13 | 3.68 | 39.95 | 8.92 | 28.31 |
| May | 42.74 | 19.38 | 3.67 | 39.72 | 8.18 | 29.04 |
| July | 47.48 | 17.37 | 3.83 | 35.50 | 7.35 | 35.91 |
| September | 30.99 | 17.55 | 3.97 | 36.72 | 10.09 | 31.66 |
| November | 30.72 | 17.49 | 3.99 | 36.88 | 10.32 | 31.22 |
| Average | 37.49 | 18.29 | 3.77 | 37.62 | 9.12 | 31.17 |

### DRY MATTER

The mean values of DM% varied from 30.72 to 47.48. The minimum DM% was found in November. This might be due to unhealthy leaves and absence of flowers in this season. The maximum DM % was found in July. It might be due to rainy season and maximum amount of leaves and flowers. Generally the DM% was greater in summer season followed by spring and winter seasons as mentioned in Fig – 1.



Scanned with CamScanner

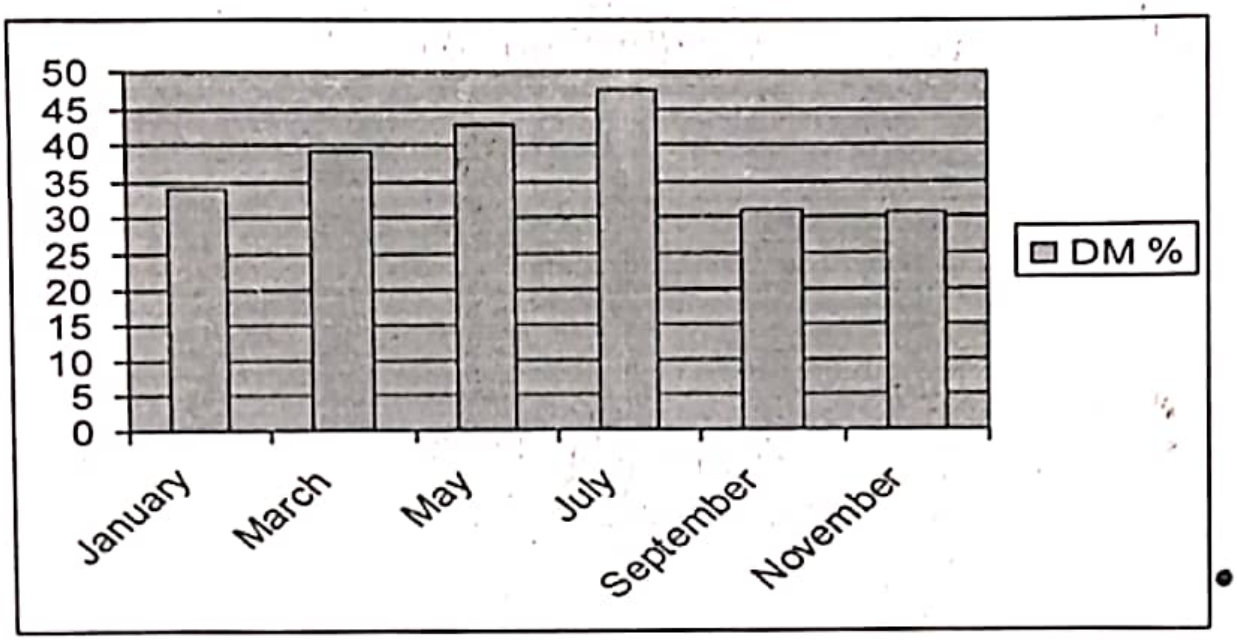



**Fig -1: Dry Matter percentage in leaves and twigs of *Acacia modesta***

**CRUDE PROTEIN**

The mean values of CP% varied from 17.37 to 19.38. The minimum CP% was found in July. The maximum CP% was found in May which might be due to more leaf and flower growth in the growing season of Phulai which commences from March – April. In general CP% increased from autumn to spring season almost linearly. This trend might be due to more suitable conditions for leaf and flower growth as indicated in F ig-2.

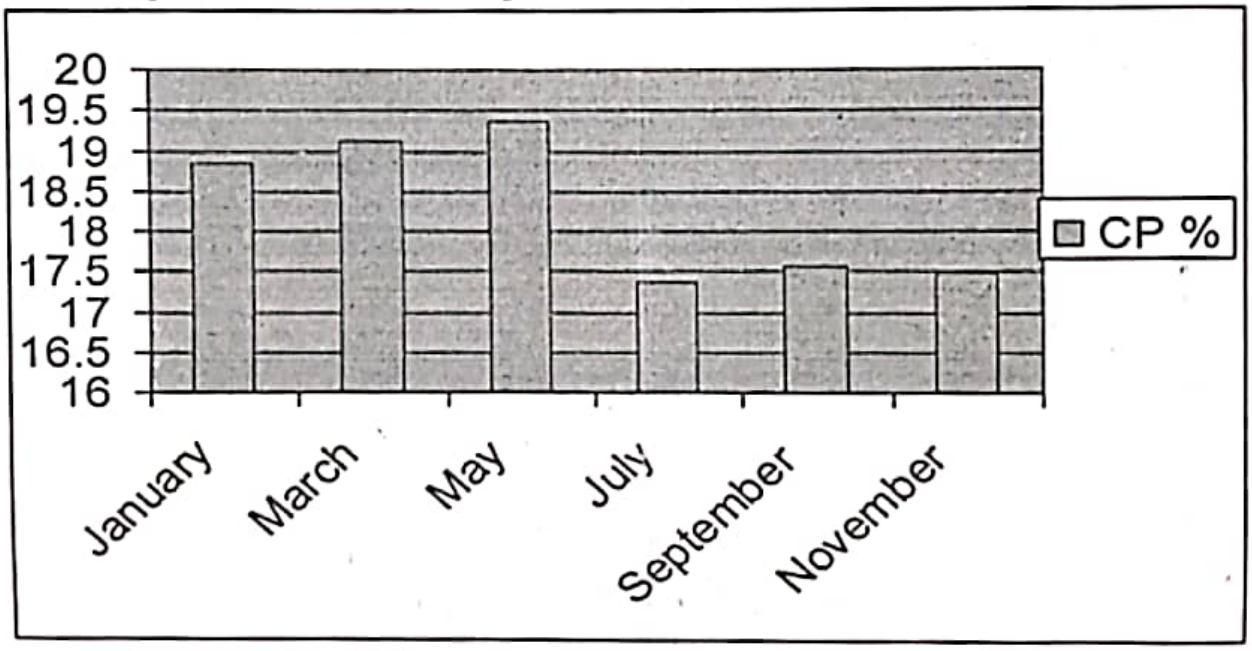



**Fig-2: crude protein percentage in leaves and twigs of *Acacia modesta***

**CRUDE FIBRE**

The mean values of CF% varied from 35.50 to 39.95. The minimum CF% was found to be in July. This might be due to more fresh leaf growth in monsoon season. The maximum CF% was found in March which might be due to less growth of fresh leaves and more lignocellulose in the old leaves



Scanned with CamScanner

in winter season. In general CF% decreased from spring to monsoon almost linearly. This trend might be due to more suitable conditions for leaf and flower growth as shown in Fig-3.

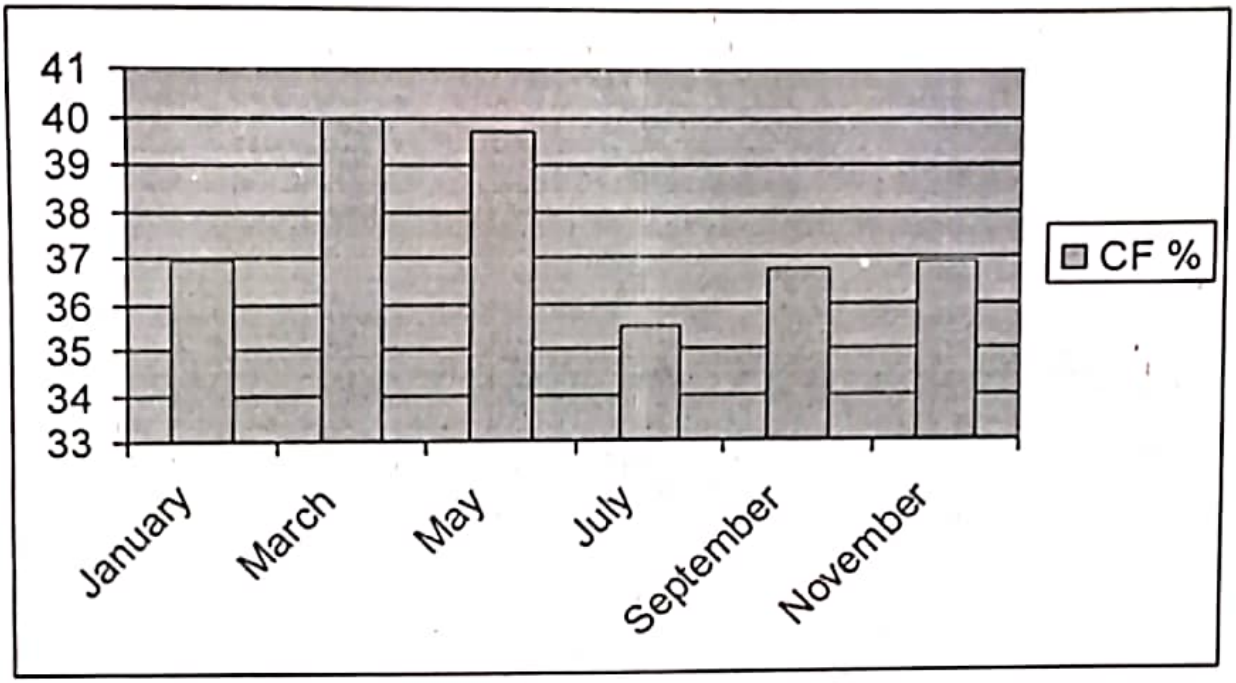



**Fig 3: Crude fibre percentage in the leaves and twigs of *Acacia modesta***

**ETHER EXTRACT**

The Fig-4 indicates that mean values of EE % varied from 3.49 to 3.99. The minimum EE % was found to be in January. This might be due to less leaf growth during the dormant season. The maximum EE % was found in November which might be due to ripening of flowers. In general EE % was more in winter followed by autumn and summer seasons.

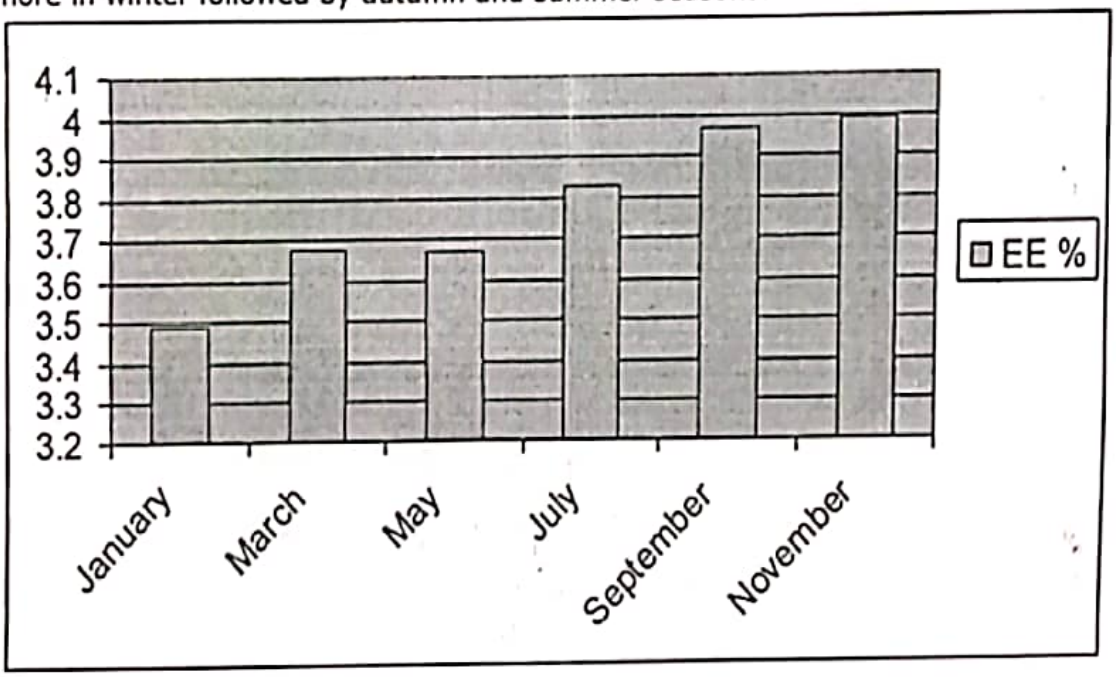



**Fig- 4: Ether Extract Percentage in the Leaves and Twigs of *Acacia modesta***



Scanned with CamScanner

## ASH

The Fig-5 depicts that mean values of Ash % varied from 7.35 to 10.32. The minimum Ash% was found to be in July. This might be due to low accumulation of salts in the fresh leaves. The maximum Ash % was found in November which might be due to more accumulation of salts in the old leaves. In general Ash% was more in winter followed by spring, summer and autumn seasons almost linearly.

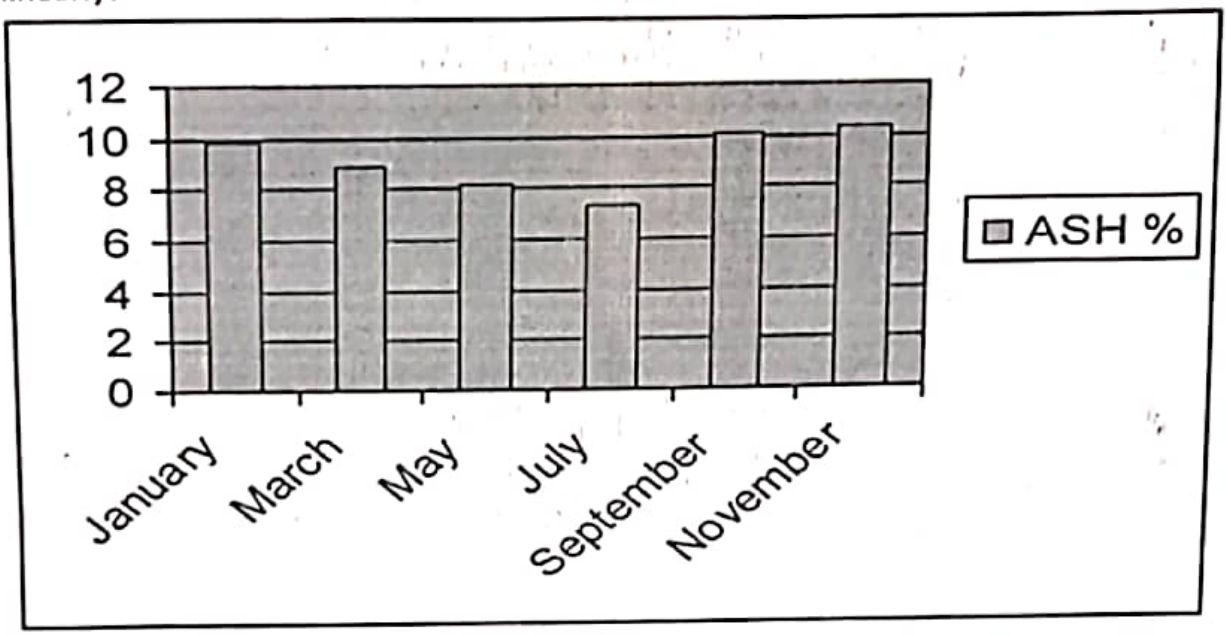



**Fig 5: Ash percentage in the leaves and twigs of *Acacia modesta***

## NITROGEN – FREE EXTRACT

The mean values of NFE% varied from 28.31 to 35.91. The minimum NFE% was observed in March and the maximum in July. As evident from Table-1 the values of NFE%, that are mainly composed of organic matter increased from March to July. It was attributed to more suitable conditions in March and July for the synthesis of organic matter for different nutrients of the tree (Fig- 6).

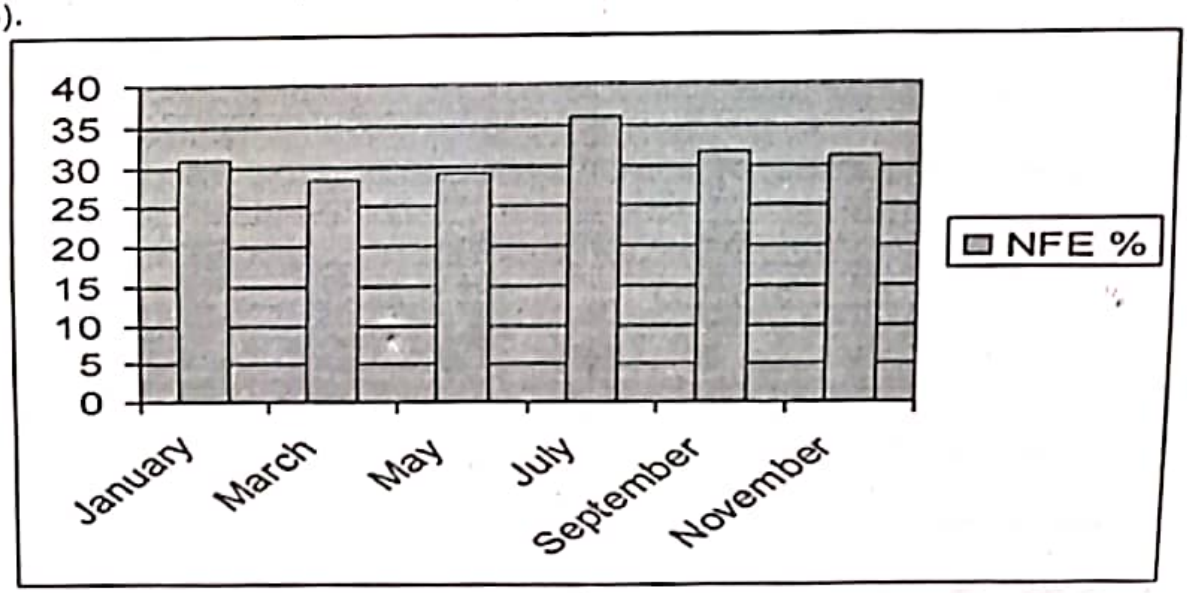


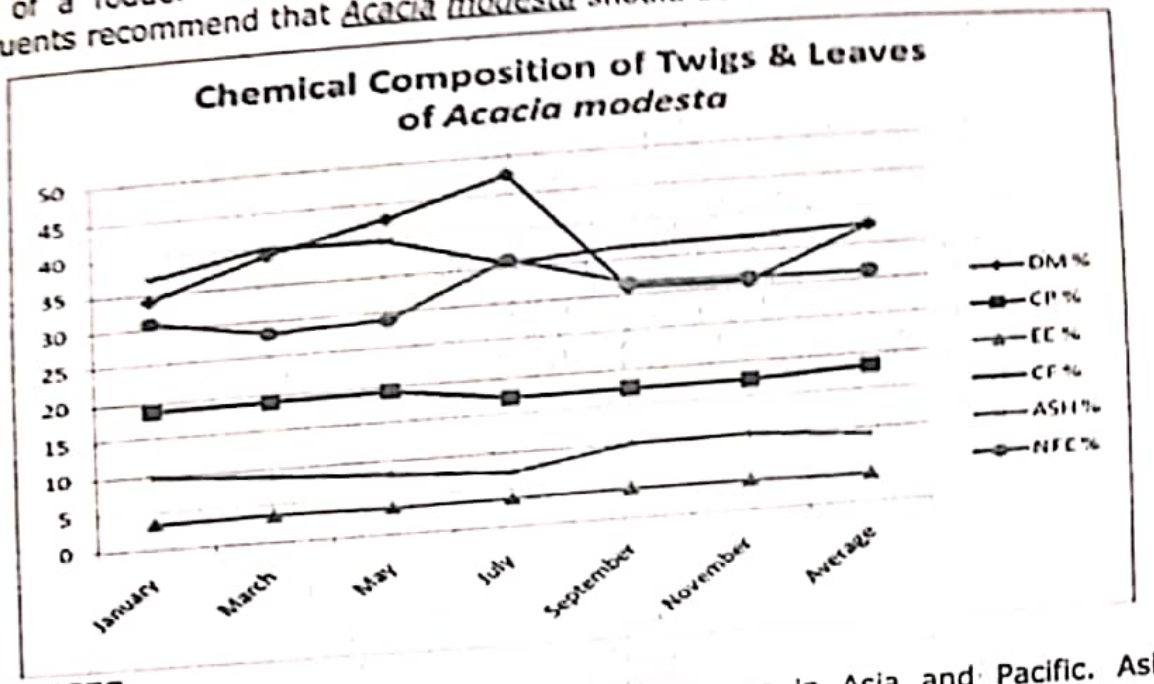

**Fig 6: Nitrogen free extract percentage in the leaves and twigs of *A. modesta***



Scanned with CamScanner

## CONCLUSIONS

The results revealed that DM percent was maximum in summer and minimum in autumn. CP and CF percent was maximum in spring and minimum in summer. Reverse was the case for NFE. However, EE and ASH percent was maximum in autumn. As the CP and CF content of twigs and leaves of a fodder tree account for its nutritive value, the maximum percentages of these constituents recommend that *Acacia modesta* should be utilized in spring season.




## REFERENCES


- Akram, M. 1990. Pakistan. Animal feed resources in Asia and Pacific. Asian Productivity Organization, Tokyo.
- Andru, J.M. Labonne, H. Guerin and A. Bilha. 1992. Acacia nilotica: a traditional forage species among the Afar of Djibouti. FAO-Animal Production and health paper (102): 277-293.
- GOP, 2009-10. Economic survey, Govt. of Pakistan. Finance Division, Economic Advisors Wing, Islamabad.
- AOAC, 1984. Official methods of analysis (4th edition), Association of Agricultural Chemists, Washington, D.C.
- Bangash, S.H. 1977. Salt tolerance of forest tree species as determined by germination of seeds at different salinity. Pak. J. For. 27(2): 93-97.
- FAO, 1992. Animal Production and Health Paper. Food and Agriculture Organization of the United Nations, Rome. (102): 277-293.
- Hasnain, H. 1983. Feed – The key to more food in Pakistan. Proc. FAO PARC Workshop on Least Cost Formulation, Islamabad. March, 1983.
- Laurie, M.U. 1945. Fodder trees in India. Ind. For. Leaflet. 82. (Silva) F.R.I. Dehra Dun.
- Roberts, T.J. 1977. The mammals of Pakistan. Ernest Benn Limited, London & Tonbridge.
- Sen, K.C. and Ray, S.N. 1971. Nutritive values of Indian cattle feeds and the feeding of animals. Indian Counc. Agric. Res., New Delhi, 133p.
- Sharma, K.N. Singh and J.L. Ogra, 1990. Performance of Barbari goats fed on Acacia nilotica (desi babul) and Leucaena leucocephala (subabul) foliage. Indian J. Anim. Sci. 60 (6): 746-747.
- Singh, K.H. and V.D. Mudgal. 1957. Chemical composition and nutritive value of Leucaena glauca (white popinac). Ind. J. Dairy Sci. 20: 191-5.
- Singh, R.V. 1982. Fodder trees of India. Oxford and IBH Publishing Co. New Dehli.
- Storrs, A.E.G. 1982. More about trees. Forest Department Ndola, Zambia. 126pp.




Scanned with CamScanner